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Transport phenomena with chiral fermions in strong magnetic fields

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The strong magnetic fields induced by heavy-ion collisions have attracted a lot of interests in transport phenomena in QGP. While the roles of the chiral fermions played in the anomaly-induced transport phenomena have been intensively investigated, their manifestations in the dissipative transport phenomena have not been fully identified. We discuss the heavy-quark diffusion dynamics [1], electrical conductivity [2,3], and viscosities [4] in QGP under the strong magnetic field on the basis of the hard thermal loop resummation, putting an emphasis on the roles of the chiral properties of the lowest-Landau-level fermions. We discuss crucial roles of the chirality conservation and phenomenological consequences, which sheds light on the new aspects of the transport phenomena in the heavy-ion collisions.

Recent related works include the computation of the jet energy loss [5], shear viscosity [6], and the electrical conductivity with the higher Landau levels [7].

[1] K. Fukushima, K. Hattori, H.-U. Yee, and Y. Yin, "Heavy Quark Diffusion in Strong Magnetic Fields at Weak Coupling and Implications for Elliptic Flow," Phys. Rev. D93 (2016) no.7, 074028.

[2] K. Hattori, S. Li, D. Satow, and H.-U. Yee, "Longitudinal Conductivity in Strong Magnetic Field in Perturbative QCD: Complete Leading Order," Phys. Rev. D95 (2017) no.7, 076008.

[3] K. Hattori and D. Satow, "Electrical Conductivity of Quark-Gluon Plasma in Strong Magnetic Fields," Phys. Rev. D94 (2016) no.11, 114032.

[4] K. Hattori, X.-G. Huang, D. Rischke, and D. Satow, "Bulk Viscosity of Quark-Gluon Plasma in Strong Magnetic Fields," Phys. Rev. D96 (2017) no.9, 094009

[5] S. Li, K. Mamo, and H.-U. Yee, Phys. Rev. D94 (2016) no.8, 085016

[6] S. Li and H.-U. Yee, arXiv:1707.00795 [hep-ph].

[7] K. Fukushima and Y. Hidaka, arXiv:1711.01472 [hep-ph].

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